The Relationship between Premature Rupture of Membranes and Maternal and Neonatal Outcomes

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Abstract: Premature rupture of membranes is an obstetric problem with an obscure etiology, difficult to diagnose and is associated with significant maternal and neonatal morbidity and mortality. Its management strategies are diverse and controversial. **The aim of this study:** was to identify the relationship between premature rupture of membranes and maternal and neonatal outcomes**. Subjects and method:** The study was conducted at obstetric departments' labor units of two settings; Tanta University hospital and El-Menshawy hospital. A convenient sample of 120 parturient women who fulfilled the inclusive criteria were included in the study. Three tools were used for data collection; **Tool (I): A structured interview schedule** that included **(a).** Socio demographic characteristics, **(b),** Reproductive history, and **(c).** History of present pregnancy. **Tool (II): Maternal outcome assessment observational checklist** that included two parts. **Part I:** assessment of general condition of the women, and **Part II:** obstetrical and local abdominal examination**. Tool (III): Neonatal outcome assessment observational checklist. Results:** The results of the present study revealed that there was a significant relation between premature rupture of membranes and the occurrence of maternal and neonatal outcomes. Socio-demographic factors include residence, income; age, educational level, and occupation were risk factors predictors of premature rupture of membranes. History of abortion, and exposure to infection, anemia, strenuous effort/activity, and number of follow up visits were also significant risk factors predictors of premature rupture of membranes. **Conclusion:** The gestational age in weeks and latent period of premature rupture of membranes were the main determinants of maternal and neonatal outcomes. Prematurity is the principal risk to the fetus with its associated morbidity. On the other hand, infectious morbidity is the primary maternal risk among women. **Recommendations:** Premature rupture of membranes is one of the most importance obstetric complications that should be focused in the curriculum of basic nursing education as well as continuing education. Additionally, antenatal classes should be planned and developed in order to increase pregnant women's awareness to seek obstetrical care regarding premature rupture of membranes at proper time.

Keywords: Premature Rupture of Membranes, Maternal Outcome, Neonatal Outcome.

I. Introduction

Spontaneous rupture of membranes is a normal component of the process of labor occurring during the active stage of labor. Rupture of membranes (ROM) before the onset of labor is defined as premature rupture of membranes (PROM). PROM is a major and significant obstetric emergency problem, It is a disruption of the fetal membranes "amnion and chorion" with resultant leakage of amniotic fluid prior to the onset of labor [(1)]. PROM is a common obstetric phenomenon occurs between 3%-18.5 % of pregnancies. Nine to ten percent of these occur at term, while the rest of them (8.5%) occur before term [(2)]. In Egypt, a study done at Zagazig University reported that the incidence of PROM occurs in 12% of all pregnancies [(3)]. Approximately 8–10% of pregnancies ending at term will experience ROM prior to the onset of true labor pain [(4)]. If PROM occurs before completion of 37 weeks of gestation, it is called preterm premature rupture of membranes (PPROM) [(1)]. Preterm premature rupture of membranes (preterm PROM) complicates 2–4% of all singletons, and about 7–20% of twin pregnancies. It is the leading identifiable cause of premature birth, and can account for approximately 18–20% of perinatal deaths [(5)]. PPROM complicates about one in every thousand births and is responsible for substantial perinatal mortality [(3)]. It is the leading identifiable cause of premature birth and accounts for approximately 18% to 20% of perinatal deaths in the United States [(6).]

The cause of PROM is unknown in most cases, but it was believed that an inherently weak fetal membrane might be a cause. However, when the fetal membranes were tested after premature rupture, they were found to be just as strong as membranes from normal term deliveries. Current studies reveal that a bacterial invasion related to ascending vaginal infection often precedes and may possibly be the cause of PROM in 30% to 40% of the cases. However, this doesn't mean the presence of an intra amniotic infection [(7)]. There are many risk factors found to be associated with PROM. However, there are cases found to be without identifiable causes of PROM [(8)]. These include; increased intrauterine pressure with multiple gestations and polyhydramnios; inflammatory processes such as cervicitis and amnionities; placenta previa; abruptio placenta; abnormalities of internal cervical os; and multiple amniocentesis. Other risk factors for occurrence of PROM include a positive history in a prior pregnancy; socioeconomically disadvantaged pregnant

women; increased gestational age; inadequate prenatal care; nutritional deficiencies especially in zinc, vitamins C, copper; smoking; and decreased immunity [7, 9].

Premature ruptures of membranes (PROM) as well as prolonged rupture of membranes have serious obstetric outcome and complication for the pregnant woman and her fetus or neonate. The maternal complication includes chorio-amnionitis. The risk of clinically evident chorio-amnionitis seems greatest in the first 72 hours, and decreases with advanced latency [10]. Fetal and neonatal complications result from sever oligohydramnios, duration of latency, and duration of pregnancy at PROM include; increased fetal and neonatal morbidity and mortality, fetal pulmonary hypoplasia, immaturity, respiratory distress syndrome, intra ventricular hemorrhage, necrotizing enterocolitis, skeletal deformities; and neonatal infections [11, 12].

Premature ruptures of membranes (PROM) is associated with significant maternal and neonatal mortality and morbidity. Its management strategies are still diverse and with concerns of a different focus for either preterm or term. If there is no evidence of fetal or maternal compromise, expectant management at hospital rather than at home is preferable, since the risk of caesarean sections may decrease. Concerns shared in the clinical management of term and preterm PROM includes cord prolapse, breech or transverse lie, traumatic delivery, and sepsis. Thus, careful consideration of various factors and individualization of cases are mandatory [3, 13, 14].

Aim of the study

The aim of this study was to identify the relationship between premature rupture of membranes and maternal and neonatal outcomes.

Research Question:

What is the relationship between premature rupture of membranes and maternal and neonatal outcomes?

II. Subjects and Method:

i. Study design:

A correlational design was used in this study. Such design fits the nature of the study under investigations, in which the researcher tried to investigate the relationship between PROM and maternal and neonatal outcomes. The comparison was done between two groups, group one, and group two.

ii. Setting:

The study was conducted at obstetric departments' labor units at two setting:

1. Tanta University hospital.
2. El-Menshawy hospital.

iii. Subjects:

According to equation of power analysis, the study compromised of convenient sample of 120 parturient women that based on 95% confidence, 80% power of the study. The sample was divided in two equal groups; group one (60 parturient women diagnosed with PROM), and group two (60 parturient women diagnosed with matured ROM). 60 women were selected from labor unit in each previously mentioned setting. The entire sample of the study was selected according to the following inclusion criteria:

- Parturient women at their early first stage of labor:

1. Diagnosed with premature rupture of membranes (PROM) or matured rupture of membranes (ROM).
2. Aged from (20 - 35) years.
3. Normal course of pregnancy (free from medical and obstetrical complications).
4. Singleton fetus.

iv. Tools of data collection:

Tools of data collection were developed by the researcher based on relevant literature and used to collect data about the study subjects as follows:-

Tool (I): A structured interview schedule was used to collect data about-

a. **Socio-demographic characteristics that included** age, education, occupation, residence, and income.
b. **Reproductive history that included:** gravidity, parity, number of abortion, number of still birth, number of living children, mode of last delivery, history of PROM with previous delivery, complications arise during previous delivery including preterm delivery, and antenatal booking (initial visit, follow up visits).
c. **Present pregnancy history that included** menstrual history, present complains at admission time, and women's life style: recent coitus before PROM, activity (history of recent effort before PROM), general condition in relation to diet (diagnosed anemia before PROM), and diagnosed genito-urinary infection before PROM.

Tool (II): Maternal outcome assessment observational checklist: was used to assess the impact of PROM on maternal outcome and involved two parts as follows:

Part I: Assessment of general condition of the women on admission that included vital signs (temperature, blood pressure, pulse rate, and respirations).

Part II: Obstetrical and / or local abdominal examinations where the following assessment items were revealed:- presence of uterine tenderness as a sign of chorio-amnionitis, progress of labor, induction of labor, intake of drugs, duration of each stage of labor, mode of delivery, and occurrence of complications during labor.

Tool (III): Neonatal outcome assessment observational checklist:

Neonatal outcome assessment observational checklist was used to determine the impact of PROM on neonatal outcome and recorded by the researcher. It included the neonatal Apgar score to assess the need for neonatal resuscitation based on its five items {A: activity (muscle tone), P: pulse, G: grimace (reflexes), A: appearance (skin color), and R: respiration} that indicate the physiologic state of the neonate after birth at 1^{st} and 5^{th} minutes. In addition, the complications that arised immediately after birth as meconium aspiration, respiratory distress syndrome such as (tachyapnea, cyanosis, grunting, chest retraction, and nasal flaring), convulsion, need of resuscitations and oxygen administration were also noted and recorded

Method

1. **Administrative approval:**
   Official permission for carrying out the study was obtained from the responsible authority before conducting this study through official letters from the Faculty of Nursing Tanta University.
2. **Developing the tools:**
   Three tools, 1) a structured interview schedule, 2) maternal outcome assessment observational checklist, and 3) neonatal outcome assessment observational checklist were developed and used in this study after reviewing recent literature. The interview sheet was reviewed by supervisors of thesis. Then, they were translated and tested for content and construct validity by three experts in the related field and modifications were carried out accordingly. Tool's reliability was tested using appropriate statistical test.
3. **Ethical consideration:**
   All parturient women who were approached to participate in the study were informed orally about the purpose of the study, confidentiality of information and right to withdraw from the study at any time if desired. Subjects who agreed to participate in the study were asked to give their consent orally.
4. **The pilot study:**
   A pilot study was carried out before the actual study on 10% of the sample (12 parturient women), 6 parturient women with PROM (group one) and 6

parturient women with matured ROM (group two) from Tanta university hospital, and El-Menshawy hospital. They were selected to test the clarity, feasibility and applicability of the different items of the study tools. The necessary modifications, rephrasing, and some additional terms were done by the researcher based on the results of the pilot study before carrying out the actual study. Data obtained from the pilot study were excluded from the current study data.

5. **The actual study (field work):**
   - Data were collected from a convenient sample of 120 cases over a period of six months from the beginning of June 2015 at the morning, afternoon, and night shifts until the predetermined sample size were collected. All cases were presented at the time of data collection had the inclusion criteria at each setting were included in the study. Data were collected individually for each parturient woman of the two groups (group one and group two) at their early 1st stage of labor on admission to labor unit by the following tools:
   - **Tool I: Structured interview schedule**: The researcher introduced herself to each of the parturient women and explained the aim of the study. She asked the questions in Arabic language for all parturient women, and recorded the answer in the pre-developed tool I in about 15 minutes.
   - **Tool II: Maternal assessment observational checklist**: was used to record general and abdominal examination findings in about 10 minutes for each parturient women. The researcher observed, recorded and, followed up each parturient women's progress of labor by assessing the progress of uterine contraction (increased in frequency, intensity, and duration, and the ongoing cervical dilatation and fetal decent), intake of drugs, duration of each stage of labor (first, second, and third stage of labor), mode of delivery, induction of labor, and complications that might be arised during labor such as (cord prolapse, chorioamnionitis, preterm labor, abruptio placenta, maternal distress, and retained placenta).
   - **Tool III: Neonatal assessment observational checklist:**

     Neonatal Apgar score: It was assessed by the researcher immediately at 1st and 5th minute

after birth. All items of Apgar score including {A: activity (muscle tone), P: pulse, G: grimace (reflexes), A: appearance (skin color), and R: respiration} were assessed and recorded for each neonate of the two groups (group one and group two) in the neonatal Apgar scoring sheet. The total score was calculated to determine the neonatal condition. In addition, temperature, weight, neonatal suckling reflex, crying and complications that arised immediately after birth as meconium aspiration, respiratory distress syndrome such as (tachyapnea, cyanosis, grunting, chest retraction, and nasal flaring), convulsion, need of resuscitations and oxygen administration were also noted and recorded. It consumed about 15 minute for each neonate.

6. Data analysis:

- The collected data were organized, tabulated and statistically analyzed using SPSS soft ware (Statistical Package for the Social Sciences, version 16, SPSS Inc. Chicago, IL, USA) [15].

Results:

Table (I): Shows the general condition of the studied women (diagnosed with PROM and matured ROM). About one quarter of women, (25.0%) had elevated temperature more than 37.6^{0}**C** among G1 compared to only 3.3% among G2. The difference observed was statically significant (P= 0.001).

Figure (I): Illustrates that the women who had PROM with duration of first stage (<12 hours), second stage (<1 hour), and third stage (<10 minutes) were (50%, 47.5%, and 42.5% respectively) compared to (83.3%, 79.2%, and 70.8% respectively) of G2.

Figure (II): Represents that there is a significant difference between G1 and G2 regarding presence of uterine tenderness, ineffective uterine contraction, and appearance of maternal complications during labor (chorioamnionitis and preterm labor) in favor of G1 rather than G2.

Figure (III): Demonstrates that nearly two thirds (61.7%) of neonates who born to women with PROM were more liable to have marked complications at birth (respiratory distress syndrome, meconium aspiration, increased need of resuscitation and oxygen administration, and convulsion) compared to one quarter

(25%) of G2. The difference observed was statically significant (P= 0.0001).

Table (II): Demonstrates that there is a significant relation between latent period and gestational age among G1 where, women whose gestational age in weeks were advanced (Mean±SD 37.11±0.40), their latent period of PROM were less than 24 hours compared to those at early gestational age (Mean±SD 34.18±0.88) were more than seven days. The relation was statistically significant (P = 0.0001).

Table (III): Illustrates that the most significant variables of socio-demographic characteristics considered risk factors predictors of PROM were residence (0.0001) as well as income (0.0001) followed by (age (P = 0.008), educational level (P = 0.003), and occupation (P = 0.002) respectively).

Table (IV): Demonstrates that the most significant variables of the history of current pregnancy as risk factors predictors of PROM were those women who diagnosed with genitourinary infection before PROM (P = 0.0001) followed by activity/ effort before PROM (P = 0.001), number of follow up visits (P = 0.004), number of abortion (P = 0.037) and those who diagnosed with anemia (P = 0.047) respectively).

Table (V): Reveals that PROM considered a risk factor predictor for the nature of uterine contraction (P = 0.0001), as well as intake of drugs (P = 0.0001) followed by duration of labor (P = 0.001), uterine tenderness (P = 0.001), and preterm labor (P = 0.001) which were regarded as significant variables of maternal outcomes as a result of occurrence of PROM statistically (P<0.05).

Table (VI): Demonstrates that PROM considered a risk factor predictor for the occurrence of marked neonatal complication (respiratory distress syndrome, meconium aspiration, need resuscitation and oxygen administration, and convulsion) at birth which was regarded as the most significant variables of neonatal outcome as a result of occurrence of PROM statistically (P = 0.012).

Table (I): Percent distribution of the studied women according to their general condition (n=120).

General condition of the mother	Group (1) (women with PROM) (n=60)		Group (2) (Women with matured ROM) (n=60)		χ^2	P
	N	%	N	%		
▪**Vital signs:**						
-Temperature (^{0}C):						
Up to 37.5	45	75.0	58	96.7	11.582	0.001*
37.6 & more	15	25.0	2	3.3		
-Pulse rate (b/m):						
Up to 90	46	76.7	50	83.3	0.833	0.361
90 & more	14	23.3	10	16.7		
-Respiration (c/m):						
Up to 20	48	80.0	48	80.0	0.000	1.000
20 & more	12	20.0	12	20.0		
-Systolic Blood pressure (mmHg):						
< 110	23	38.3	26	43.3	0.310	0.577
110-<140	37	61.7	34	56.7		
≥ 140	0	0	0	0		
-Diastolic Blood pressure (mmHg):						
< 80	23	38.3	26	43.3	0.310	0.577
80-<100	37	61.7	34	56.7		
≥ 100	0	0	0	0		

***Significant (P<0.05**

Figure (I): Percent distribution of the studied women according to the duration of stages of labor (n=120).

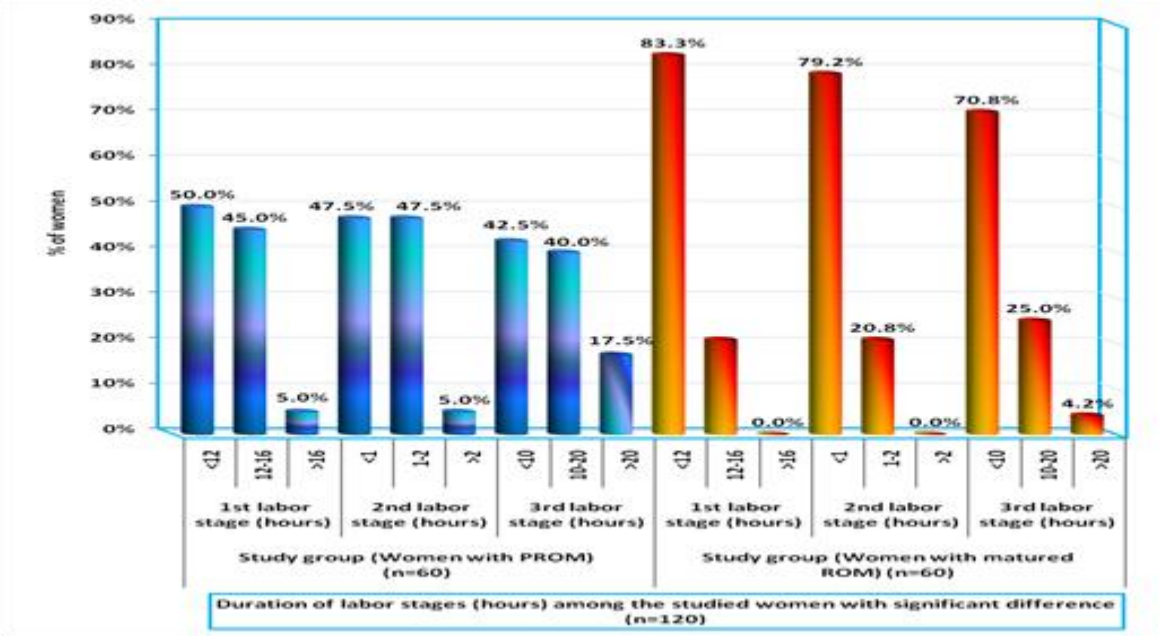

Figure (II): Percent distribution of the studied women according to their local (obstetric) examination (n=120).

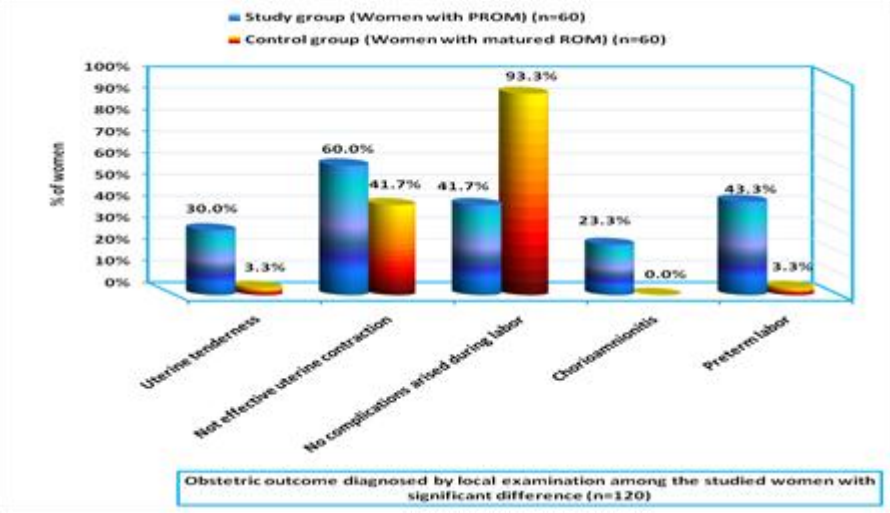

Figure (III): Percent distribution of the studied women according to their neonatal complications after birth (n=120).

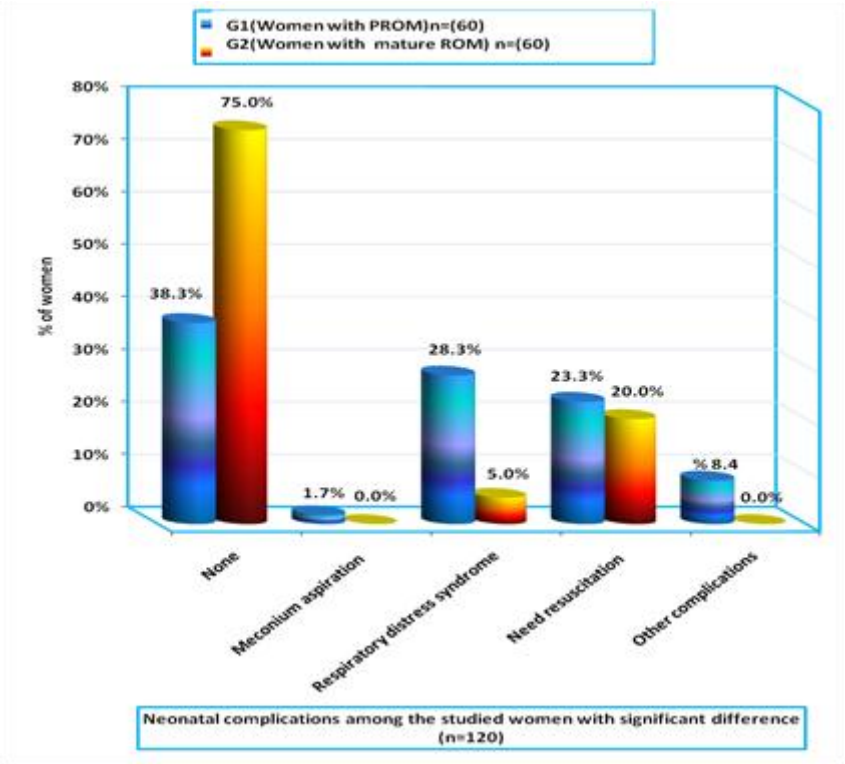

Table (II): Relationship between latent period and gestational age of the studied women (G1) (women with PROM) (n=60).

Duration of leakage (Latent period)	Mean gestational age in weeks among the group one G1 (women with PROM) (n=60)	
	Mean±SD	t-test P
▪ **Duration of leakage (latent period):** < 24 hours	37.11±0.40	84.966 0.0001*
24-<72 hours	34.00±0.82	
72 hrs-<7 days	34.75±1.50	
≥ 7 days	34.18±0.88	
R P	-0.839 0.0001*	

***Significant (P<0.05)**
r= Correlation coefficient
Latent period = Interval between rupture of fetal membranes and delivery

Table (III): Binary logistic regression analysis of socio-demographic characteristics as risk factors predictors of PROM among the studied women.

Variables	B	SE	P	Exp (B)	95% confidence interval	
					Lower limit	Upper limit
Age	1.019	0.384	0.008*	2.770	1.305	5.879
Education level	0.664	0.226	0.003*	1.942	1.247	3.023
Occupation	2.159	0.709	0.002*	0.115	0.029	0.463
Residence	2.512	0.663	0.0001*	12.331	3.362	45.230
Income	1.922	0.401	0.0001*	6.833	3.111	15.007

B=Logistic Regression Coefficient
SE=Standard Error of B
P=Significance
Exp (B)=Estimated Odds Ratio
***Significant (P<0.05)**

Table (IV): Binary logistic regression analysis of reproductive and current history of pregnancy as risk factors predictors of PROM among the studied women.

Variables	B	SE	P	Exp (B)	95% confidence interval	
					Lower limit	Upper limit
Gravidity	0.560	0.683	0.412	1.751	0.459	6.677
Parity	0.069	0.538	0.898	0.933	0.325	2.679
Number of abortion	1.599	0.767	0.037*	0.202	0.045	0.909
History of preterm delivery	10.738	0.008	0.998	0.000	0.000	0.000
Antenatal booking:(Time of initial antenatal visits)	0.368	0.673	0.585	0.692	0.185	2.591
Number of follow up visits	2.232	0.775	0.004*	9.316	2.041	42.513
Women diagnosed with genitourinary infection before PROM	1.339	0.352	0.0001*	0.262	0.131	0.522
Women diagnosed with anemia before PROM	0.928	0.467	0.047*	0.395	0.158	0.987
Occurrence of recent coitus before PROM	0.475	0.297	0.109	0.622	0.348	1.112
Occurrence of recent effort before PROM	2.794	0.845	0.001*	0.061	0.012	0.320

B=Logistic Regression Coefficient
SE=Standard Error of B
P=Significance
Exp (B)=Estimated Odds Ratio
***Significant (P<0.05)**

Table (V): Binary logistic regression analysis of PROM as a predictor of maternal outcome among the studied women.

Variables	B	SE	P	Exp (B)	95% confidence interval	
					Lower limit	Upper limit
Preterm labor	2.733	0.791	0.001*	0.065	0.014	0.307
Duration of labor stages	1.574	0.484	0.001*	0.207	0.080	0.535
Intake of drugs	0.841	0.215	0.0001*	0.431	0.283	0.657
Nature of uterine contraction	1.161	0.250	0.0001*	3.194	1.957	5.211
Abruptio placenta	19.288	5.422	0.999	0.000	0.000	
Chrioamnionitis	21.476	4.851	0.999	0.000	0.000	
Mode of delivery	0.213	0.113	0.059	0.808	0.648	1.008
Maternal distress	1.014	9.858	1.000	2.758	0.000	
Uterine tenderness	0.965	0.293	0.001*	2.624	1.477	4.662
Retained placenta	1.021	0.951	0.283	0.360	0.056	2.322

B=Logistic Regression Coefficient
SE=Standard Error of B
P=Significance
Exp (B)=Estimated Odds Ratio
***Significant (P<0.05)**

Table (VI): Binary logistic regression analysis of PROM as a predictor of neonatal outcome among the studied women.

Variables	B	SE	P	Exp (B)	95% confidence interval	
					Lower limit	Upper limit
Neonatal Apgar score (at the 1st and 5th minute after birth)	0.140	0.171	0.411	0.869	0.622	1.214
Neonatal fever	1.314	0.887	0.139	0.269	0.047	1.605
Neonatal body weight	20.380	9.397	0.997	0.008	0.000	
Neonatal suckling reflex	0.057	1.269	0.964	1.059	0.088	12.744
Neonatal complications	1.054	0.422	0.012*	0.348	0.152	0.796

B=Logistic Regression Coefficient
SE=Standard Error of B
P=Significance
Exp (B)=Estimated Odds Ratio
***Significant (P<0.05)**

III. Discussion:

Premature rupture of membranes (PROM) is a possible complication of pregnancy. Infection, preterm birth, placental abruption, prolapse of umbilical cord, amniotic fluid infection, and fetal distress are significantly increased because of PROM. Current clinical treatment for PROM, especially preterm PROM, has been progressed, but there is no ideal method yet. Therefore, the research on the cause of PROM, as well as how to manage PROM through treatment, nursing intervention and prevention of other pregnancy complications are of great significance [(16)].

It was noticed from the results of this study that women's among G1 (women with PROM) their age ranged from 20 to less than 25 years, were illiterate, were working, from rural residence , and also those of low income. Concerning maternal outcome of the studied women, the finding of this study demonstrated that there was a significant relation between PROM and increased maternal temperature, presence of uterine tenderness, and ineffective uterine contraction. This can be justified by that, the increase of latent period greater than 24 hours that have been reported in the present study, increases the opportunities of ascending infection resulting in elevated temperature more than 37.6 0C, presence of uterine tenderness, ineffective uterine contractions and increases need of taking drugs during labour, as well as increases duration of labour (first, second, and third stage).

The findings of this study also, demonstrated that there was a statically significant relation between PROM and occurrence of maternal complications. Where slightly more than half of those who have PROM had maternal complications during labor such as (cord prolapse, maternal distress and sepsis, preterm labor, chorioamnionitis, abruptio placenta, and retained placenta) compared to only 6.7% in group two. Additionally, onset of preterm labor also affected by the residual amount of amniotic fluid after membrane rupture. By meaning, oligohydramnios is associated with a shorter interval ranging from PROM to the time of delivery that increases risk of preterm labor [(17)]. ***Dars et al (2014)*** support this finding [(10)]. They clarified that among patients with PROM the most likely outcome was preterm delivery with its associated morbidity and mortality. On the other hand, ***D'souza et al (2015)*** [(18)], ***Stuart et al (2005)*** [(19)], and ***Tavassoli et al (2010)*** [(20)], reported in their studies that infection

was the most important complication of preterm PROM. Increased incidence of infection among cases of these studies might be contributed to that those women who had preterm PROM were associated with longer latency periods, in addition to the delay in initiation of prophylactic antibiotics that might be contributory factors to infection.

Moreover, ***Sirak and Mesfin (2014)*** [(21)]**,** are in harmony with the finding of this study. They declared that the proportion of mothers presenting with established chorioamnionitis is high in a study of maternal and perinatal outcome of pregnancies with preterm PROM in Ethiopia. This may be due to the longer latency period that aggravated the chance of infection. Additionally, amniotic fluid has certain bactericidal properties, which protect against potential infection, by meaning that decrease in amniotic fluid volume may impair the pregnant women's ability to combat such infection and cause increased risk of infection [(20)].

Furthermore, the present study revealed that, nearly two thirds of the neonates who born to women with PROM were more liable to have complications at birth such as (respiratory distress syndrome, the need for resuscitation, oxygen administration, convulsion, and also meconium aspiration) compared to one quarter in group two. The difference observed was statically significant. This can refer to the relation between gestational age/weeks at PROM and latency period. By meaning of, that preterm PROM and PROM with prolonged latent period more than 24 hours increases the risk of neonatal complication. This is compatible with the findings of a study by ***Yu et al (2015)*** [(22)]. They indicated that weeks of gestation/gestational age at the time of PROM and the latency period were significantly associated with neonatal mortality or morbidity. ***Gezer et al (2013)*** [(23)], stated that the most common neonatal morbidities of preterm PROM cases were respiratory distress syndrome, sepsis and intra ventricular hemorrhage. The discrepancy reported may be related to different sample sizes and that all cases of the previous study were preterm PROM with longer latency periods that increases incidence of infection.

Latency period is defined as the interval between rupture of the fetal membranes and the onset of labor. It is not clear what influences the latency period although several factors were previously linked with shorted latency such as gestational age [(24)]. ***Test et al (2011)*** [(4)], and ***Trivedi et al (2016)*** [(25)], reported that there is inverse relation exists between gestational

age/weeks at the time of PROM and latent period. Their findings are in line with the findings reported in the present study. They illustrated that advanced gestational age/weeks (PROM with completed 37 weeks of gestation) was found to be associated with the shortest latent periods (less than 24 hours) of PROM to time of delivery. On the other hand, earlier gestational age/weeks (preterm PROM) were found to be associated with the longest latent periods (more than seven days). A study conducted by ***Peaceman et al (2015)*** [(26)], noted that latency with preterm PROM can last for weeks, and that preterm PROM at earlier gestations appear to have longer latency to delivery, this is in agreement with the present study however, no enough data exist to describe latency at specific gestational ages.

In order to predict the occurrence of PROM among pregnant women based on a set of predictor variables. Binary logistic regression was applied in the present study. Binary logistic regression is called logistic model, analyzes the relationship between multiple independent variables and a categorical dependant variable, and estimates the probability of occurrence of an event by fitting data to a logistic curve [(27)].

Concerning binary logistic regression analysis of socio-demographic characteristics, the findings of the present study demonstrated that the socio-demographic factors include residence, income, age, educational level, and occupation are risk factors predictors of PROM. Meanwhile, ***Ortiz et al (2008)*** [(28)], did not find any relation or statistical significance between women's socio-economic variables and the risk of having PROM. This discrepancy might be related to that the majority of the study sample are residing in rural areas where education and income of women have little variation, compared to urban areas. On the same line with this study, ***Goldenberg et al. (2008)*** [(29)] in a systematic review of a number of well designed predominantly retrospective cohort studies concluded that maternal age was not a significant predictor of preterm PROM. On the other hand, these results are in agreement with that reported in the study of ***Al-Hussain et al (2012)*** [(6)], who revealed that the risk factors of PROM include woman's job status and residence**.** Additionally, ***Yildiz et al (2012)*** [(30)] who investigated the risk factors according to gestational age among cases of PROM illustrated that age and education were effective factors of membrane rupture among the cases of the study.

Additionally, the present study confirmed that previous history of abortion was a risk

factor predictor of PROM. This is not in agreement with ***Kovavisarach and Sermsak (2000)*** [31], who found that there was no significant relation between history of abortion in the previous pregnancy and PROM. Furthermore, this study also showed that genitourinary infection experienced during pregnancy before PROM, history of recent effort/activity PROM, number of follow up visits, history of abortion, and anemia experienced during pregnancy, were significant risk factors predictors of PROM. These findings are harmonized by ***Choudhary et al (2015)*** [32] study who stated that low socio-economic group with associated factors such as overexertion, recurrent infections, anemia & poor antenatal care considerably increase the risk and strong predictors of PROM.

The findings of this study are also supported by ***Yildiz et al (2012)*** [30], who asserted that infection, and trauma experienced during pregnancy could trigger membrane rupture in < 34 gestational weeks. However, ***Yildiz et al (2012)*** [30] also, underlined that parity, gravidity, and coitus frequency could be effective risk factors predictors in the occurrence of membrane rupture in < 34 gestational week, as well as previous history of preterm delivery also, was significant risk factor as reported in other studies [17, 33]. These are in contradiction with the findings of the present study. This discrepancy may be related to different criteria of the studied population.

Binary logistic regression analysis was also, done for both maternal and neonatal outcome among women with PROM. The present study revealed that PROM is regarded as a risk factor predictor for onset of preterm labor, uterine contraction, and intake of drugs during labor followed by increased duration of labor, and uterine tenderness among women as mentioned before. This finding is in proportion to ***Hirsch et al (2017)*** [34], who pointed out that PROM is a predictor of uterine contractions and added that uterine contractions and cervical examination parameters can be used for prediction of prolonged interval to spontaneous onset of labor in women with PROM. ***Rajan and Menon(2016)*** [35], found that PROM associated with anemia increases maternal and perinatal mortality and morbidity rates consequent to preterm delivery. In addition, ***Irshad et al (2012)*** [36], reported that history of PROM was regarded as a risk factor for occurrence of preterm labor. These findings are also in agreement with the findings of the present study. PROM was also, considered as the most important

predictor of neonatal morbidity in the present study. Where occurrence of unfavorable neonatal outcomes increased in neonates delivered to women with PROM, this is in agreement with the other results reported by ***Sirak and Mesfin* (2014)** [(21)].

IV. Conclusion:

Based on the findings of the present study, it can be concluded that there is a significant relation between premature rupture of membranes (PROM) and maternal and neonatal outcomes. Maternal and fetal morbidity was found to be highly significant among PROM group compared to normal group. *Prematurity* is the principal risk to the fetus while *infectious* morbidity is the primary maternal risk among women. Socio-demographic characteristics, reproductive history, and history of current pregnancy were risk factors predictors of PROM. On the other hand, gestational age and latent period were the main determinants of maternal and neonatal outcomes among PROM group.

V. Recommendations

This study recommended that refreshing courses and training programs based on evidence-based practice should be provided for maternity nurses to improve their knowledge and practice regarding PROM and maternal and neonatal outcomes. In addition, public orientation through mass media should be directed toward women at risk of PROM to prevent and /or reduce its related maternal and neonatal complications.

VI. References

1. **Patricia A., Marcia L., & Michele R.** Contemporary Maternal – Newborn Nursing Care. 8th ed., United States, Pearson Education com., 2014; 421-3.
2. **Hernandez-y B.A., Lopez-Faran J.A., & Gamez-Guevara C.** Comparison of Maternal and Perinatal Outcomes in the Conservative Treatment of Preterm Premature Membrane Rupture between the Use of Erythromycin and Clindamycin. Gynecology and Obstetrical Mexico Journal, 2011; 79(7): 403-10.
3. **Elsabagh E.E.** Impact of Premature Rupture of Membranes on Maternal and Neonatal Outcome at Zagazig University Hospital. Master Thesis. Faculty of Nursing. Zagazig University. 2006; 71-8.
4. **Test G., Levy A., Wiznitzer A., Mazor M., Holcberg G., Zlotnik A., & Sheiner E.** Factors Affecting the Latency Period in Patients with

Preterm Premature Rupture of Membranes. Archives of Gynecology and Obstetrics, 2011; 283(4): 707-10.

5. **Caughey A.B., Robinson J.N., & Norwitz E.R.** Contemporary Diagnosis and Management of Preterm Premature Rupture of Membranes. Reviews in Obstetrics and Gynecology, 2008; 1(1): 11-22.
6. **Al-Hussain T.K., Mohamed S.N., Alam El-dien H., & Ahmed A.A.** Cervicovaginal Infection during Pregnancy and Its Relation to Preterm Pre-Labour Rupture of Membranes. Journal of American Science, 2012; 8(12): 364-73.
7. **Elizabeth S.** Manual of High Risk Pregnancy and Delivery. 5th ed., India, Mosby com., 2011; 524-30.
8. **Chandra I., & Sun L.** Third Trimester Preterm and Term Premature Rupture of Membranes: Is There any Difference in Maternal Characteristics and Pregnancy Outcomes?. Journal of the Chinese Medical Association, 2017; 80(10): 657-61.
9. **Cunningham F., Leveno K., & Bloom S.** Williams Obstetrics. 24th ed., New York, McGraw- Hill Education com., 2014; 832-5.
10. **Dars S., Malik S., Samreen I., & Kazi R.A.** Maternal Morbidity and Perinatal Outcome in Preterm Premature Rupture of Membranes before 37 Weeks of Gestation. Pakistan Journal of Medical Sciences, 2014; 30(3): 626-9.
11. **Chakraborty B., Mandal T., & Chakraborty S.** Outcome of Prelabor Rupture of Membranes in a Tertiary Care Center in West Bengal Indian. Journal of Clinical Practice, 2013; 24(7): 657-62.
12. **Magowan B., Owen P., & Thomson A.** Clinical Obstetrics and Gynecology. 3rd ed., India, Saunders Elsevier com., 2014; 203-9.
13. **Konar H.** Text Book of Obstetrics Including Perinatology and Contraception. 6th ed., India, Chintamoni Das Lane com., 2010; 317-9.
14. **Bhargava V., & Sinha S.** Obstetrics. 2nd ed., New Delhi, Ane-Books com., 2013; 182-8.
15. **Dawson B.D., & Trapp R.G.** Reading the medical literature: Basic & Clinical Biostatistics. 3rd ed., New York, Lange Medical Book, McGraw–Hill, & Medical Publication Division com., 2011; 161-218, 305-14.

16. **Li N., Fu Q., & Cai W.** Cause Analysis and Clinical Management Experience of the Premature Rupture of Membrane. Open Journal of Obstetrics and Gynecology, 2013; 3(1): 222- 6.
17. Noor S., Fawwad A., Shahzad H., Sultana R., & Bashir R. Foeto-Maternal Outcome in Patients With or Without Premature Rupture of Membranes. Journal of Ayub Medical College, 2010; 22(1): 164-7.
18. **D'souza A.S., Walia M., Gupta G., Samuel C.J., Katumalla F.S., & Goyal S.** Feto-Maternal Outcome in Pregnancies with Preterm Premature Rupture of Membranes: A tertiary Hospital Experience. International Journal of Reproduction, Contraception, Obstetrics and Gynecology, 2015; 4(5): 1529-33.
19. **Stuart E.L., Evans G.S., Lin Y.S., & Powers H.J.** Reduced Collagen and Ascorbic Acid Concentrations and Increased Proteolytic Susceptibility with Prelabor Fetal Membrane Rupture in Women. Biology of Reproduction, 2005; 72(1): 230-35.
20. **Tavassoli F., Ghasemi M., Mohamadzade A., & Sharifian J.,** Survey of Pregnancy Outcome in Preterm Premature Rupture of Membranes with Amniotic Fluid Index < 5 and ≥ 5. Oman Medical Journal, 2010; 25(2): 118-23.
21. **Sirak B., & Mesfin E. M**aternal and Perinatal Outcome of Pregnancies with Preterm Premature Rupture of Membranes at Tikur Anbessa Specialized Teaching Hospital, Addis Ababa, Ethiopia. Ethiopian Medical Journal, 2014; 52(4): 165-72.
22. **Yu H., Wang X., Gao H., You Y., & Xing A.** Perinatal Outcomes of Pregnancies Complicated by Preterm Premature Rupture of the Membranes Before 34 Weeks of Gestation in A tertiary Center in China: A retrospective Review. Bioscience Trends, 2015; 9(1): 35-41.
23. **Gezer A., Parafit-Yalciner E., Guralp O., Yedigoz V., Altinok T., & Madazli R.** Neonatal Morbidity Mortality Outcomes in Pre-Term Premature Rupture of Membranes. Journal of Obstetrics and Gynecology, 2013; 33(1): 38-42.
24. **Aziz N., Cheng Y.W., & Caughey A.B.** Factors and Outcomes Associated with Longer Latency in Preterm Premature Rupture of Membranes. The Journal of Maternal-Fetal and Neonatal Medicine, 2008; 21(11): 821-5.

25. **Trivedi S.S., Puri M., & Agrawal S.** Management of High Risk Pregnancy - A Practical Approach. 2nd ed., Bangladesh, Jaypee Brothers com., 2016; 67-70, 97-110.
26. **Peaceman A.M., Lai Y., Rouse D.J., Spong C.Y., Mercer B.M., & Varner M.W.** Length of Latency with Preterm Premature Rupture of Membranes before 32 Weeks' Gestation. *American Journal of Perinatology,* 2015; 32(1): 57-62.
27. **Park H.A.** An Introduction to Logistic Regression: From Basic Concepts to Interpretation with Particular Attention to Nursing Domain, Journal of Korean Academy of Nursing, 2013; 43(2):154-64.
28. **Ortiz F.M., Soto Y.G., Del-Refugio V.G., Beltran A.G., Castro E.Q., & Ramirez I.O.** Social-economic and Obstetric Factors Associated to Premature Rupture of Membranes. Gynecology and Obstetrical Mexico Journal, 2008; 76(8): 468-75.
29. **Goldenberg R.L., Culhane J.F., Iams J.D., & Romero R.** Epidemiology and Causes of Preterm Birth. Lancet, 2008; 371(9606): 75-84.
30. **Yildiz H., Abali S., & Keskin S.** Investigation of Risk Factors According to Gestational Age in Cases with Premature Rupture of Membrane. Pakistan Journal of Medical Sciences, 2012; 28(1): 124-9.
31. A Case-Control Study. The Australian and New Zealand Journal of Obstetrics and Gynecology, 2000; 40(1): 30-2.
32. **Choudhary M., Rathore S.B., Chowdhary J., & Garg S.** Pre and Post conception Risk factors in Premature Rupture of Membranes. International Journal of Research in Medical Sciences, 2015; 3(10): 2594-8.
33. **Tufail A., Hashmi A., & Naheed F.,** Risk Factors for Preterm labor in a Rural Cohort. Medical Channel Journal, 2009; 15(2): 55-7.
34. **Hirsch L., Krispin E., Aviram A., Mor-Shacham M., Gabbay-Benziv R., Yogev Y., & Ashwal E.** Predictors for Prolonged Interval From Premature Rupture of Membranes to Spontaneous Onset of Labor at Term. Journal of Maternal-Fetal and Neonatal Medicine, 2017; 30(12):1465-70.
35. **Rajan R., & Menon V.** Preterm Premature Rupture of Membranes: Correlates and Pregnancy Outcome in A Tertiary Care Setting. International Journal of Research in Medical Sciences, 2016; 4(8): 3310-6.
36. **Irshad M ., Ahmad A., Ahmed K.F., Hayat M., Kareem R., Hussain M., Ali N., & Khan B.** Risk Factors for Preterm Births in a Tertiary Care Hospital, Lady Reading Hospital, Peshawar. Journal of Postgraduate Medical Institute, 2012; 26(2): 158-64.